

TRANSLATOR'S VERIFICATION

I, Joseph Zacharias-Steen, B.A., State Certified Translator,
c/o Hollerallee 73, D-28209 Bremen, hereby declare that I am
conversant with the English and German languages and am a
competent translator thereof, and that the attached translation is, to the
best of my knowledge and belief, a full, true and correct English
translation of the accompanying documents from the German.

Signed this 15th day of February, 2007



- Joseph Zacharias-Steen -

Applicant:

Focke & Co. (GmbH & Co.)
Siemensstrasse 10

Our ref.:

FOC-706-DE

27283 Verden

Date:

04 Oct. 2002/5912

Method and device for recognition of a tear-off strip on a material web

D e s c r i p t i o n

The invention relates to a method for detecting, with the aid of sensors, a tear-off strip or tear-off thread applied to a material or film web. Furthermore, the invention relates to an apparatus for implementing the method.

During the production of packs with external wrapping made of film, in particular cigarette
5 packs or cigarette multi-packs, the film is provided with a tear-off thread or a tear-off strip, in order to make it easier to remove the outer wrapping when the pack is put into use. The tear-off strip is applied to a continuous material web or film web and joined to the latter. After that, the blanks for wrapping the pack are severed from the web (EP 1 209 083).

The presence and the correct positioning of the tear-off strip on the material web are
10 checked (continuously). For this purpose, in the prior art, optoelectronic sensors are used, which are aimed at the material web in the region of the tear-off strip. The sensors react to markings on the tear-off strip which can be registered optically.

The optoelectronic registration of the tear-off strip or tear-off thread fails if there is no adequate optical contrast or if, for example, the material web is entirely printed.

15 The invention is based on the object of detecting a tear-off thread or tear-off strip on a material web or film web without contact, specifically irrespective of any optical contrast.

In order to achieve this object, the method according to the invention is characterized by the following features:

- 5 a) the sensors for detecting the tear-off strip or tear-off thread are ultrasonic transmitters, on the one hand, and ultrasonic receivers, on the other hand, which are positioned on different sides of the material web,
- b) ultrasonic transmitter and ultrasonic receiver are aimed substantially exactly at the tear-off thread or tear-off strip,
- c) the ultrasonic transmitter is constructed in such a way that a lobe or response curve generated by the latter corresponds approximately to the width of the tear-off strip,
- 10 d) the ultrasonic receiver is connected to an evaluation unit which reacts to changes in the intensity of the waves picked up.

Testing thin-walled workpieces by means of ultrasound is basically known. Hitherto, this detection method has been used in double-sheet control, that is to say in checking (equally sized) sheets of thin material, in particular paper, with regard to any double-layer
15 nature.

The invention is based on the finding that, by means of ultrasonic sensors, the position of a narrow material strip, mainly of a tear-off strip or tear-off thread, on a continuous thin material web is possible, specifically during continuous testing. For this purpose, the transmitter and receiver are aimed specifically at the tear-off strip or tear-off thread in the
20 exact position of the same. The material web having tear-off strips or tear-off threads is preferably moved continuously past transmitter and receiver, in such a way that the ultrasonic waves are aimed in a concentrated manner at the region of the tear-off strip or tear-off thread.

In this case, according to the findings of the invention, the response curve of the receiver
25 can deviate (slightly) from the width of the tear-off strip, as long as a measurable difference is provided by the receiver when picking up the ultrasonic waves in order to differentiate between an existing tear-off strip and a missing tear-off strip. The dimensioning of the lobe or response curve can then be determined by the intensity of the transmitter. One special feature, however, is the configuration according to the invention
30 of the transmitter in such a way that the latter has an aperture stop that reduces the free transmitter area and which has the effect of a specific, limited response curve.

Further details of the invention relate to the expedient arrangement of the testing elements within a (packaging) machine.

Further special features of the invention will be explained in more detail below using exemplary applications and embodiments.

Fig. 1 shows a packaging machine for wrapping (cigarette) packs in a film wrapper, in a schematic side view,

5 Fig. 2 shows a detail II from the view according to Fig. 1 on an enlarged scale,

Fig. 3 shows a further enlarged detail III from Fig. 2,

Fig. 4 shows a detail of an ultrasonic transmitter, namely a plan view IV-IV of Fig. 3,

Fig. 5 shows the schematically illustrated mode of operation of ultrasonic transmitter and ultrasonic receiver when a tear-off strip is missing,

10 Fig. 6 shows a corresponding illustration with a correct tear-off strip.

The exemplary embodiment shown concerns the production of box-like packs 10, specifically cigarette packs, which are provided with an outer wrapper made of film. This has a tear-off strip 11 or a tear-off thread, which is positioned at a specific point in order to make the opening operation of the closed pack possible.

15 The tear-off strip 11 is applied to a continuous material web 12 of film for this purpose. The latter is drawn continuously from a reel 13. The continuous tear-off strip 11 is drawn from a strip reel 14 and, during transport in the same direction, is pressed onto the material web 12 and joined to the latter by a pressure roll 15. The unit comprising material web 12 with tear-off strip 11 is then supplied to a blank-cutting unit 16. In the region of the
20 latter, individual blanks - with tear-off strip 11 - are severed from the material web 12 and respectively folded around a pack 10. The apparatus for handling the tear-off strip 11, the material web 12 and for producing the blanks expediently corresponds to EP 1 209 083.

It is necessary to check whether the material web 12 is provided with a tear-off strip 11 and whether the latter is positioned correctly. A testing unit 17 is used for this purpose.

25 This operates without contact on the basis of ultrasonic waves. An ultrasonic transmitter 18 and an ultrasonic receiver 19 are positioned on opposite sides of the material web 12. The ultrasonic transmitter 18 aims ultrasonic waves specifically at the material web 12, specifically in the region of the tear-off strip 11. The opposite ultrasonic receiver 19 picks up the sound waves. Transmitter, receiver and an evaluation unit connected to the
30 receiver are constructed in such a way that any fluctuations in the intensity of the received ultrasonic waves are evaluated and findings relating to the presence or lack of a tear-off strip 11 can be obtained from this. The action of the testing unit 17 is such that, given the presence of a tear-off strip 11, attenuation by the tear-off strip 11 of the sound waves emitted occurs and, in the region of the ultrasonic receiver 19, leads to considerably
35 reduced reception.

The testing unit 17 is positioned in the region of a vertical web section 20 of the material web 12, specifically following a deflection roll 21 immediately above or in the conveying direction upstream of the blank-cutting unit 16. In the present exemplary embodiment, the testing unit 17 is accordingly positioned immediately above a suction belt 22 for the transport of the material web 12 and the severed blanks in the region of the blank-cutting unit 16. It is a matter of carrying out the testing of the tear-off strip 11 as immediately as possible before the severing of the blank.

Transmitter and receiver are arranged such that the ultrasonic waves are directed along an obliquely oriented axis 23 in an idealized manner. Accordingly, the ultrasonic waves are aimed at the material web 12 at an acute angle to the latter. The ultrasonic transmitter 18 is in this case located on the side of the tear-off strip 11, and the ultrasonic receiver 19 is located opposite on the side of the material web 12. The angle of the axis 23 with respect to the plane of the material web 12 is approximately between 70° and 45°. The distances of transmitter and receiver from the material web 12 are likewise different. The ultrasonic transmitter 18 is at a short distance, about 5 mm to 15 mm, from the material web 12, and the receiver 19 is at a greater distance of 15 mm to 65 mm.

The ultrasonic sensors are constructed in a particular way, so that a defined, limited lobe or response curve of the sound waves is produced, which is aimed exactly at the region of the tear-off strip 11. The defined response curve, approximately of the width of the tear-off strip 11, can be produced by an appropriate construction of the ultrasonic transmitter 18. In particular, the ultrasonic transmitter 18 can be provided on the outlet side with an aperture stop 24, which limits the emergence of the sound waves. In the exemplary embodiment shown in Fig. 4, the aperture stop 24 is formed in such a way that the ultrasonic transmitter 18 (of circular cross-section) has a central gap 25 running diametrically. This forms the outlet area for ultrasonic waves. The gap 25 extends in the direction of the tear-off strip 11. A focused region of the sound waves is aimed through the aperture stop 24 or the gap 25 by the ultrasonic transmitter 18 at the material web 12 in the region of the tear-off strip 11.

The course of the “lobe” or the response curve of the ultrasonic waves is shown schematically in Fig. 5 and Fig. 6, Fig. 5 showing the case of a missing tear-off strip with sound waves passing largely unhindered through the material web 12. Fig. 6 is the illustration of the correctly formed material web 12 with tear-off strip 11. The sound waves originating from the ultrasonic transmitter 18 are absorbed completely or predominantly by the material web 12 with tear-off strip 11, so that the ultrasonic receiver 19 receives no sound waves or highly attenuated sound waves.

The evaluation unit (not shown) generates a signal when the material web is not correctly provided with a tear-off strip 11, with the effect of Fig. 5.

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P a t e n t c l a i m s

1. A method for detecting a tear-off strip (11) or a tear-off thread on a material web (12) or film web with the aid of sensors, **characterized by** the following features:

- 5 a) the sensors are ultrasonic transmitters (18), on the one hand, and ultrasonic receivers (19), on the other hand, which are positioned on different sides of the material web (12),
- b) ultrasonic transmitter (18) and ultrasonic receiver (19) are positioned such that the material web (12) conveyed between ultrasonic transmitter (18) and ultrasonic receiver (19) is registered by ultrasonic waves substantially exclusively in the region of the tear-off strip (11) or tear-off thread,
- 10 c) the ultrasonic transmitter (18) is constructed in such a way that a lobe or response curve generated by the latter corresponds approximately to the width of the tear-off strip (11),
- d) the ultrasonic receiver (19) is connected to an evaluation unit which reacts to changes in the intensity of the waves picked up.

- 15 2. An apparatus for implementing the method as claimed in claim 1, a tear-off strip (11) or tear-off thread being laid continuously on a continuously conveyed material web (12) and joined to the latter and it then being possible for blanks for wrapping to be severed from the web, **characterized in that**, following a joining station of material web (12) and tear-off strip (11), a testing device for detecting the tear-off strip (11) is positioned in a

fixed location and the film web can be moved past this testing apparatus, the testing apparatus comprising at least one ultrasonic transmitter (18) and at least one ultrasonic receiver (19), ultrasonic transmitter (18) and ultrasonic receiver (19) being positioned on both sides of the material web (12) in such a way that sound waves originating from the ultrasonic transmitter (18) strike the material web (12) substantially exclusively in the region of the tear-off strip (11) and, if appropriate, can be picked up by the opposite ultrasonic receiver (19).

3. The apparatus as claimed in claim 2, **characterized in that** ultrasonic transmitter (18) and ultrasonic receiver (19) are positioned in the region of an upright section (20) of the material web (12), in particular immediately above an upright web conveyor, namely a suction belt (22) of a blank-cutting unit (16).

4. The apparatus as claimed in claim 2 or 3, **characterized in that** ultrasonic transmitter (18) and ultrasonic receiver (19) are oriented in an oblique position with respect to the plane of the material web (12).

5. The apparatus as claimed in claim 2 or one of the further claims, **characterized in that** the ultrasonic transmitter (18) is arranged underneath the ultrasonic receiver (19), preferably on the side of the material web (12) having the tear-off strip (11).

6. The apparatus as claimed in claim 2 or one of the further claims, **characterized in that** the ultrasonic transmitter (18) is provided with a limiting means on the outlet side in order to influence the characteristics or width of the response curve, in particular with a (slot-like) aperture stop (24).

7. The apparatus as claimed in claim 6, **characterized in that** the aperture stop (24) bounds a gap (25) extending diametrically over the ultrasonic transmitter (18) and running in the direction of the tear-off strip (11).

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L i s t o f d e s i g n a t i o n s

- | | |
|----|------------------------|
| 10 | Pack |
| 11 | Tear-off strip |
| 12 | Material web |
| 13 | Reel |
| 14 | Strip reel |
| 15 | Pressure roll |
| 16 | Blank-cutting unit |
| 17 | Testing unit |
| 18 | Ultrasonic transmitter |
| 19 | Ultrasonic receiver |
| 20 | Web section |
| 21 | Deflection roll |
| 22 | Suction belt |
| 23 | Axis |
| 24 | Aperture stop |
| 25 | Gap |

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A b s t r a c t
(in conjunction with Fig. 3)

In order to check a material web (12), in particular a film web, with regard to the correct arrangement of a tear-off strip (11) extending in the longitudinal direction of the material web (12), ultrasonic transmitters are used, specifically an ultrasonic transmitter (11) on the one hand and an ultrasonic receiver (19) on the other hand. The sensors are arranged on
5 opposite sides of the material web (12) in such a way that, if appropriate, focused ultrasonic waves are aimed specifically at the region of the tear-off strip (11). If a tear-off strip (11) is missing, an appropriate signal is generated by the ultrasonic receiver (19).
